SFA Modernization Partner

United States Department of Education

Student Financial Assistance

EAI Readiness Report

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Document Revision History

DATE	REVISED BY	SECTION	SUMMARY OF CHANGES
02/26/01	Brad Johnson		Created initial document.
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07/10/01	Joshua Nash	1.2, 1.3, 2.2, 2.3, 2.5, 2.6, 3.3, 4.3, 4.4, 4.5, Appendices A, B and C	Updated Sun Solaris MQSeries Version from 5.1 to 5.2
07/10/01	Joshua Nash	2.4	Revised Channel for MQSeries Listener to 1414 from 1415
07/10/01	Joshua Nash	Figure 1	Updated Diagram

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1 Introduction

1.1. Purpose

The Student Financial Assistance (SFA) Integration Architecture is comprised of build-time (development) and run-time (execution) components. Figure 1 below illustrates the build-time and run-time components within the development environment. The *Enterprise Application Integration (EAI) Readiness Report* documents the information required to install and configure the infrastructure of the development run-time environment. The installation and configuration of the development build-time environment was documented in the *Installation and Configuration Report* (Deliverable #16.1.6). The *EAI Readiness Report* also identifies the steps performed to validate that the software functioned properly within the SFA development environment.

1.2. Architecture Overview

The EAI core infrastructure consists of build-time (development) and run-time (execution) environments. Each of these environments consists of the following three main components:

- IBM MQSeries v5.1 (messaging) on NT Servers, IBM MQSeries v5.2 (messaging) on Sun Servers
- IBM DB2 UDB v6.1
- IBM MQSeries Integrator v2.0.1

Figure 1 below illustrates the EAI build-time and run-time development environments.

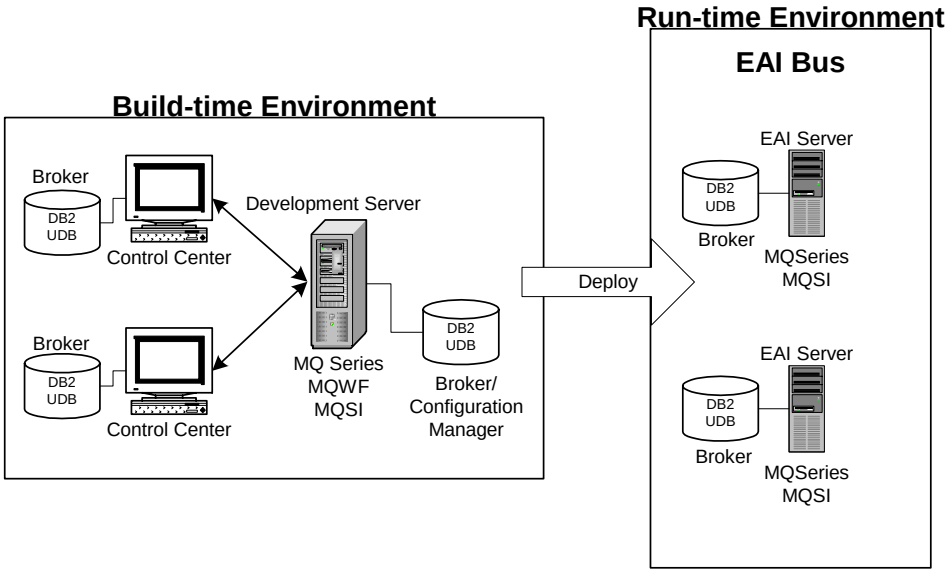

Figure 1: Logical diagram of the build-time and run-time development environment

1.3. Scope

This document covers the installation and configuration of the SFA core infrastructure for the run-time environment of the EAI bus. It includes:

- Each task, supplemental to vendor reference manuals, that was performed to install and configure the infrastructure software
- SFA-specific configurations
- Checklist of entry and exit criteria for validating the installation & configuration

The core infrastructure components include:

- IBM MQSeries v5.1 (messaging) on NT Servers, IBM MQSeries v5.2 (messaging) on Sun Servers,
- IBM DB2 UDB v6.1
- IBM MQSeries Integrator v2.0.1

1.4. Document Layout

The installation and configuration of each core infrastructure component will be documented in its own section in this document. Within each infrastructure section, the information is separated as follows:

- **Product Overview -** A brief description of the product and its functionality within the EAI core architecture.
- **Product Inventory –** Installed product and version information.
- **Development Environment Topology -** Graphically depicts the infrastructure components utilized in the EAI core architecture.
- **Product Prerequisites for Installation -** Pre-installation hardware and software specifications.
- **Workstation Requirements for Testing Installation -** Client machine requirements necessary to validate product installation and perform SFA configurations.
- **Users and Groups -** User IDs and groups constructed to install and configure the product and validate the installation.
- **Directory Structures -** Main file directories constructed to support product installation.
- **Naming Conventions -** Rules and standards that govern the labeling of objects during the product installation and configuration.
- **Installation Checklist -** Pre-installation, installation, and post-installation steps that supplement a vendor's installation manual and identifies SFA specific configurations.

- **Startup and Shutdown Procedures -** Actions to be performed to ensure the integrity of the environment. Startup involves the careful sequenced initialization of software, databases, web servers, etc. Shutdown involves saving configuration changes as needed and gracefully taking down running software in the correct sequence.
- **Backup Procedures -** Actions to be performed to protect data from loss due to adverse events, such as application errors, data corruption, user error, and hardware failure.
- **References -** Documentation used to complete the product installations and configurations. Vendor reference manuals reside at the Virtual Data Center (VDC), SFA Portals, and/or Aerospace.

2 IBM MQSeries Messaging

2.1. Product Overview

The MQSeries Messaging product provides assured, once-only delivery of messages between information technology systems. The complexities of communications programming are handled by the messaging services and are therefore removed from the application logic. Applications can access other systems and interfaces through gateways and adapters.

2.2. Product Inventory

The following product was installed on the SU35E16 and SU35E17 Sun servers with the IP addresses of 4.20.14.136 and 4.20.14.137 respectively:

- MQSeries V5.2 for Solaris (messaging)
- CSD 6 (U471246)

2.3. Development Environment Topology

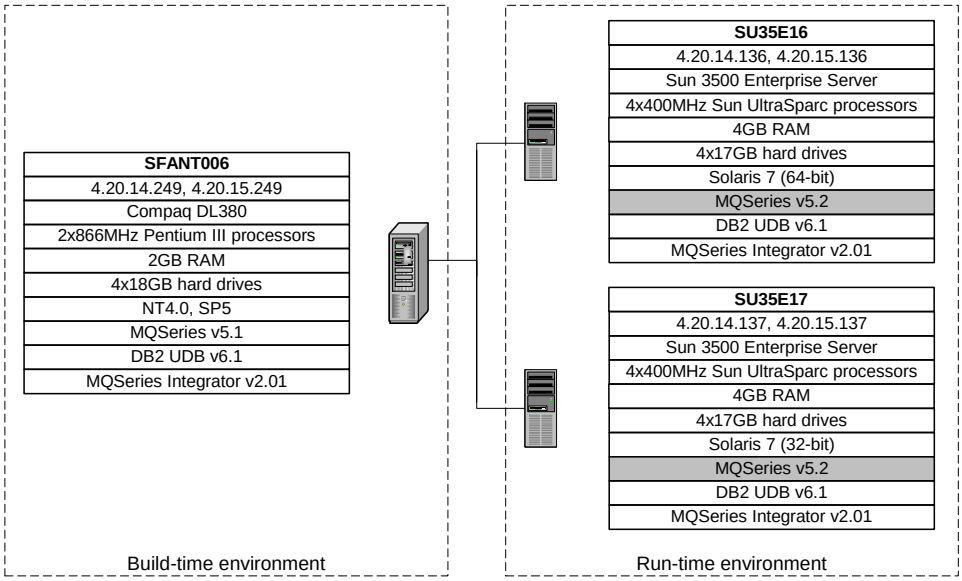

Figure 2: MQSeries development build-time and run-time environment

2.4. Product Prerequisites for Installation

The following hardware and software are required prior to installing and configuring MQSeries Messaging:

- Sun Solaris V7. No patches are required.
- Open port 1414 and 1415 by editing the /etc/services file and making the following entry:

  mqchan 1414/TCP #MQSeries Channel & MQSeries Listener
- The mqm group and user ID must be created prior to installation of any of the MQSeries products.
- The root user ID must be added to the mqm group.
- The filesystem /var/mqm was created with 75MB of space.
- Kernel parameters must be set for shared memory. This can be performed by editing the /etc/system file using the syntax "set <kernel_parameter> = <value>".

Table 1 below indicates the kernel parameters, their values, and the application requiring their use on the Sun Solaris run-time servers. An empty block indicates the parameter is not required by the application. An "X" in the block indicates the application requires the value in the "Value" column. A number in the block indicates the value required for only running that product. For example, the kernel parameter in row three, msgsys:msginfo_msgmax, must be set to 4096 to run MQSeries, but must be set to 65535 to run DB2 or MQSeries Integrator.

Kernel Parameter	Value	Required by			
		MQSeries	DB2	MQSeries Integrator	MQSeries Workflow
lwp_default_stksize	0x4000			X	
msgsys:msginfo_msgmap	1026	X	258	X	X
msgsys:msginfo_msgmax	65535 (or higher)	4096	X	X	X
msgsys:msginfo_msgmnb	65535	X	X	X	X
msgsys:msginfo_msgmni	256		X	X	X
msgsys:msginfo_msgseg	32768		X	8192	X
msgsys:msginfo_msgssz	16		X	X	X
msgsys:msginfo_msgtql	1024		X	256	X
rpcmod:svc_run_stksize	0x4000		X		
semsys:seminfo_semaem	16384			X	X
semsys:seminfo_semmap	1026	X	X	X	X
semsys:seminfo_semmni	1024	X	X	X	X
semsys:seminfo_semmns	16384	X	2048	X	X
semsys:seminfo_semmnu	2048	X	X	X	X
semsys:seminfo_semmsl	125	100		X	100
semsys:seminfo_semopm	100	X		X	X
semsys:seminfo_semume	256	X		X	X
shmsys:shminfo_shmmax	3865470566 (90% of physical memory)	X	X	X	X
shmsys:shminfo_shmmni	1024	X	300	X	X
shmsys:shminfo_shmseg	1024	X	16	X	X

Table 1: MQSeries kernel parameters for Sun Solaris 7

2.5. Workstation Requirements for Testing Installation

The MQSeries V5.1 client software must be installed on any client application that needs to use the messaging capabilities of MQSeries V5.1.

2.6. Users and Groups

The *mqm* group and the *mqm* user ID were created for the installation of MQSeries V5.2 on both SU35E16 and SU35E17. The *root* user ID was added to the *mqm* group on both servers as well.

2.7. Directory Structures

The following directories were loaded with owner mqm and group mqm. The directory properties were automatically set during installation of the MQSeries package. If needed, the directory properties may be reset by the Sun administration command 'pkgchk'.

Directory	Size	Contents
/var/mqm	75 MB	Default location of MQSeries work files
/opt/mqm (on /opt filesystem)	6 GB (available on /opt filesystem)	Default location of MQSeries program files
/var/mqm/log (in /var/mqm filesystem)	Shared with /var/mqm	Default location of MQSeries log files
/var/mqm/errors (in /var/mqm filesystem)	Shared with /var/mqm	Default location of MQSeries errors
/var/mqm/trace (in /var/mqm filesystem)	Shared with /var/mqm	Default location of MQSeries trace logs. This directory is optionally used if trace is enabled. Default is trace disabled

Table 2: MQSeries Messaging directory structure on Sun Solaris run-time servers

2.8. Naming Conventions

The standard for naming the default queue manager is to use the hostname for the server. A test queue manager has been created on both SU35E16 and SU35E17 named MQSI_SAMPLE_QM.

In all other instances of the product installations, defaults were used.

2.9. Installation Checklist

See Appendix A – IBM MQSeries Messaging Installation Checklist.

2.10. Startup and Shutdown Procedures

2.10.1. Startup

All MQSeries messaging components are currently started and stopped manually. See Chapter 17: MQSeries Control Commands in the *MQSeries System Administration Guide* for additional information on the following commands:

Task	Command
start a queue manager	strmqm <queue_manager_name>
run a listener	runmqlsr –t tcp –p <port_number> –m <queue_name>
run a channel	runmchl –c <channel_name> -m <queue_manager_name>

2.10.2. Shutdown

The following commands are used to shutdown the MQSeries objects:

Task	Command
shutdown a channel	shutdown the associated listener
shutdown a listener	endmqlsr –m <queue_manager_name>
shutdown queue manager	endmqm –c <queue_manager_name>

2.11. Backup Procedures

To take a backup of a queue manager's data:

- Ensure that the queue manager is not running. If the queue manager is running, stop it with the endmqm command. The backup may not be consistent if performed while the queue manager is running due to updates in progress when the files were copied.
- Locate the directories under which the queue manager places its data and its log files. These directories are specified in the configuration file, qm.ini, located in the /var/mqm /qmgrs/<queue_manager_name> directory.
- Take copies of all the queue manager's data and log file directories, including all subdirectories. Make sure all of the files and directories are present, especially the log control file and the configuration files. Some of the directories may be empty, but they will all be required if the backup is restored at a later date, so it is advisable to save them too.

- Ensure that file ownership is preserved. This is done automatically with *tar* on the Sun Solaris run-time platform.

For information on backing up and restoring the MQSeries system, please refer to Chapter 15: "Recovery and restart" in the *MQSeries System Administration Manual*.

2.12. References

- *MQSeries System Administration Manual*
- *MQSeries Quick Beginning for Sun Solaris*

3 IBM DB2 UDB

3.1. Product Overview

DB2 Universal Database (UDB) is IBM's relational database server solution for the UNIX, OS/2, and Windows NT/2000 operating environments. IBM's MQSeries Integrator comes bundled with DB2 with no additional licensing fee. The database is required for storage of the MQSeries Integrator broker configuration information (for example, the message flows that are assigned to it). Each broker requires access to the database to create and maintain internal data in tables. DB2 v6.1 is the only DBMS supported by MQSeries Integrator that permits the database to participate as a Resource Manager in a distributed XA transaction. MQSeries acts as the XA Transaction Manager in this configuration.

3.2. Product Inventory

The following product was installed on the SU35E16 and SU35E17 Sun servers with the IP addresses of 4.20.14.136 and 4.20.14.137 respectively:

- IBM DB2 UDB V6.1
- FixPak 2 (U469454)

3.3. Development Environment Topology

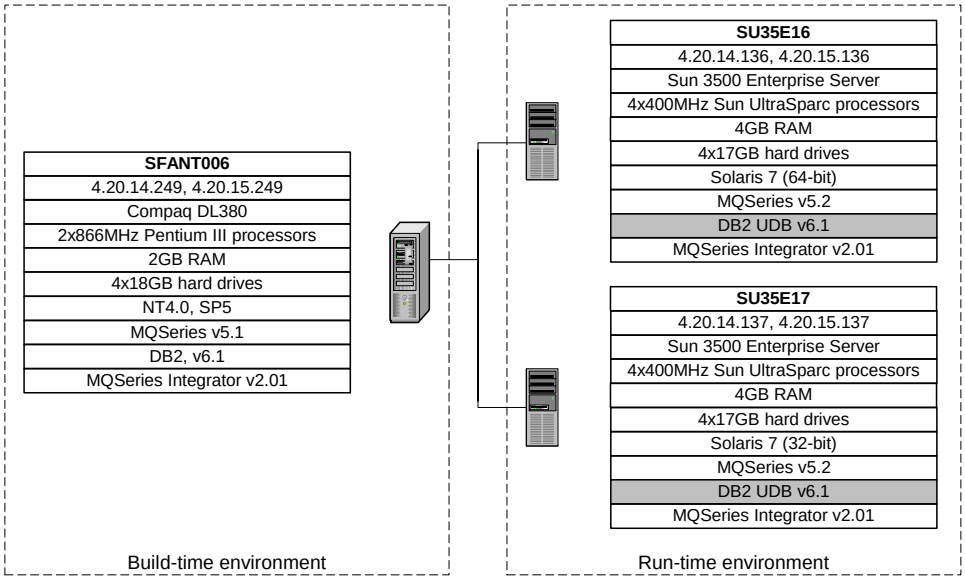

Figure 3: DB2 UDB development build-time and run-time environment

3.4. Product Prerequisites for Installation

The following hardware and software prerequisites are required prior to installation and configuration of the IBM DB2 UDB:

- Separate filesystems should be created for the DB2 application software as well as each instance of DB2 that will be created and used. The filesystems /opt/IBMdb2, /db2imqsi, and /db2ifmc were created for MQSeries Integrator and Workflow on SU35E16 and SU35E17. The /opt/IBMdb2 filesystem was created with 500MB of space and both /db2imqsi and /db2ifmc were created with 2GB of space each.

Table 3 below indicates the kernel parameters, values, and applications requiring their use on the Sun Solaris run-time servers. An empty block indicates the parameter is not required by the application. An "X" in the block indicates the application requires the value in the "Value" column. A number in the block indicates the value required for only running that product. For example, the kernel parameter in row three, msgsys:msginfo_msgmax must be set to 4096 to run MQSeries, but must be set to 65535 to run DB2 or MQSeries Integrator.

Kernel Parameter	Value	Required by			
		MQSeries	DB2	MQSeries Integrator	MQSeries Workflow
lwp_default_stksize	0x4000			X	
msgsys:msginfo_msgmap	1026	X	258	X	X
msgsys:msginfo_msgmax	65535 (or higher)	4096	X	X	X
msgsys:msginfo_msgmnb	65535	X	X	X	X
msgsys:msginfo_msgmni	256		X	X	X
msgsys:msginfo_msgseg	32768		X	8192	X
msgsys:msginfo_msgssz	16		X	X	X
msgsys:msginfo_msgtql	1024		X	256	X
rpcmod:svc_run_stksize	0x4000		X		
semsys:seminfo_semaem	16384			X	X
semsys:seminfo_semmap	1026	X	X	X	X
semsys:seminfo_semmni	1024	X	X	X	X
semsys:seminfo_semmns	16384	X	2048	X	X
semsys:seminfo_semmnu	2048	X	X	X	X

Kernel Parameter	Value	Required by			
		MQSeries	DB2	MQSeries Integrator	MQSeries Workflow
semsys:seminfo_semmsl	125	100		X	100
semsys:seminfo_semopm	100	X		X	X
semsys:seminfo_semume	256	X		X	X
shmsys:shminfo_shmmax	3865470566 (90% of physical memory)	X	X	X	X
shmsys:shminfo_shmmni	1024	X	300	X	X
shmsys:shminfo_shmseg	1024	X	16	X	X

Table 3: DB2 kernel parameters for Sun Solaris 7

3.5. Workstation Requirements for Testing Installation

There are no workstation requirements. The following installation verification steps should be performed on the server:

- Log on to the system as a user with system administrative (SYSADM) authority.
- Enter the db2sampl command to create the SAMPLE database. The SAMPLE database is automatically catalogued with the database alias SAMPLE when it is created.
- Start the database manager by entering the db2start command.
- Enter the following commands to connect to the SAMPLE database, retrieve a list of all the employees that work in department 20, and reset the database connection:
  - db2 connect to sample
  - db2 "select * from staff where dept = 20"
  - db2 connect reset

3.6. Users and Groups

The *db2admin* group and *db2inst* user ID were created for the installation of DB2. The *db2inst* user ID was added to the *mqm* group. The root user ID was added to the *db2admin* group. The *db2imqsi*, *db2as*, and *db2fenc1* user IDs were created by the DB2 instance creation utility during the db2imqsi DB2 instance creation process. The *db2imqsi*, *db2as*, and *db2fenc1* user IDs were added to the *mqm*, *mqbrkrs*, *db2admin*, and *db2asgrp* groups.

3.7. Directory Structures

Table 4 lists the filesystems created for DB2 V6.1 on both SU35E16 and SU35E17. The filesystem /opt/IBMdb2 was loaded with user:group ownership of db2inst:db2admin during the DB2 installation. The filesystems /db2imqsi and /db2ifmc were created for the data storage for MQSeries Integrator and MQSeries Workflow respectively, and have the user:group ownerships of db2imqsi:db2admin and db2ifmc:db2admin, respectively.

Directory	Size	Contents
/opt/IBMdb2	500 MB	Default location for all DB2 application files
/db2imqsi	2 GB	DB2 instance (data) directory for MQSI
/db2ifmc	2 GB	DB2 instance (data) directory for MQSeries Workflow

Table 4: DB2 directory structure on Sun Solaris run-time servers

3.8. Naming Conventions

See *Integrated Technical Architecture Detailed Design Document – Volume 4 EAI Architecture* (Deliverable 16.1.2) for a description of the recommended naming conventions for the EAI product systems.

3.9. Installation Checklist

See Appendix B – IBM DB2 UDB V6.1 Installation Checklist.

3.10. Startup and Shutdown Procedures

DB2 services are started and stopped automatically. The DB2 startup script can be located at /etc/rc.db2 and is called by /etc/inittab on server startup on both Sun Solaris run-time servers SU35E16 and SU35E17.

3.11. Backup Procedures

Please refer to the MQSeries document *MQSeries Integrator Version 2.0.1 Administration Guide* for information on backing up and restoring the MQSeries Integrator system.

3.12. References

- *MQSeries Integrator Version 2.0.1 Introduction and Planning*
- *MQSeries Integrator Version 2.0.1 Sun Solaris Installation Guide*
- *MQSeries Quick Beginning for Sun Solaris*

4 IBM MQSeries Integrator

4.1. Product Overview

The MQSeries Integrator product provides users with a quick and easy way to implement real-time, application-to-application message transformation and intelligent message routing. The flexibility and scalability of MQSeries Integrator lets users add, extend, or replace applications within information flows to achieve business integration. It enables the business intelligence of the enterprise to be captured as rules and applied to business events.

Highlights of MQSeries Integrator are:

- Forms the key product in the message brokering layer of the IBM business integration framework.
- Has an open framework allowing a choice of built-in components or third-party offerings.
- Allows message formats to be defined through a dictionary, either one supplied with the product or a third party dictionary.
- Complies with industry standards such as SQL and XML.
- Includes significantly enhanced publish/subscribe function compatible with base MQSeries pub/sub.
- Provides graphical tools for constructing how events or data are handled.

4.2. Product Inventory

The following products were installed on the development runtime Sun servers, SU35E16 and SU35E17, with the IP addresses of 4.20.14.136 and 4.20.14.137, respectively:

- MQSeries Integrator V2.0.1 for Solaris

4.3. Development Environment Topology

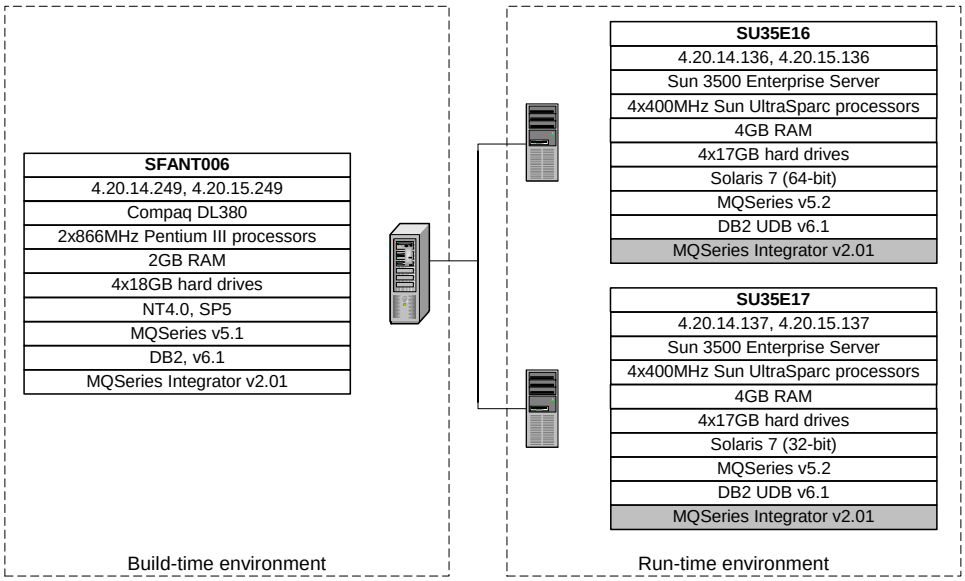

Figure 4: MQSeries Integrator development build-time and run-time environment

4.4. Product Prerequisites for Installation

The MQSeries Integrator product requires an NT server to support the build-time environment and a Sun server to support the run-time environment.

The following hardware and software prerequisites are required prior to the installation and configuration of the MQSeries Integrator V2:

- Sun Solaris V7
- MQSeries for Solaris Version 5.2 plus CSD 6 (U471246)
- The *mqsi* user ID must exist before installation.

Table 5 below indicates the kernel parameters, their values, and the application requiring their use on the Sun Solaris run-time servers. An empty block indicates the parameter is not required by the application. An "X" in the block indicates the application requires the value in the "Value" column. A number in the block indicates the value required for only running that product. For example, kernel parameter msgsys:msginfo_msgmax must be set to 4096 to run MQSeries, but must be set to 65535 to run DB2 or MQSeries Integrator.

In addition, the maximum number of concurrent open file descriptors on the system should be increased to a value greater than 256. This can be done by using the ***ulimit*** command in the shell in which the broker is being started.

Kernel Parameter	Value	Required by			
		MQSeries	DB2	MQSeries Integrator	MQSeries Workflow
lwp_default_stksize	0x4000			X	
msgsys:msginfo_msgmap	1026	X	258	X	X
msgsys:msginfo_msgmax	65535 (or higher)	4096	X	X	X
msgsys:msginfo_msgmnb	65535	X	X	X	X
msgsys:msginfo_msgmni	256		X	X	X
msgsys:msginfo_msgseg	32768		X	8192	X
msgsys:msginfo_msgssz	16		X	X	X
msgsys:msginfo_msgtql	1024		X	256	X
rpcmod:svc_run_stksize	0x4000		X		
semsys:seminfo_semaem	16384			X	X
semsys:seminfo_semmap	1026	X	X	X	X
semsys:seminfo_semmni	1024	X	X	X	X
semsys:seminfo_semmns	16384	X	2048	X	X
semsys:seminfo_semmnu	2048	X	X	X	X
semsys:seminfo_semmsl	125	100		X	100
semsys:seminfo_semopm	100	X		X	X
semsys:seminfo_semume	256	X		X	X
shmsys:shminfo_shmmax	3865470566 (90% of physical memory)	X	X	X	X
shmsys:shminfo_shmmni	1024	X	300	X	X
shmsys:shminfo_shmseg	1024	X	16	X	X

Table 5: MQSeries Integrator kernel parameters for Sun Solaris 7

4.5. Workstation Requirements for Testing Installation

The following configuration is required for testing the MQSeries suite:

- The MQSeries V5.2 client must be installed on any client application interested in using the messaging capabilities of MQSeries V5.2.
- The workstation must also have the DB2 client access software installed.

4.6. Users and Groups

The *mqsi* user ID was created for the installation of MQSeries Integrator. The *mqsi* user ID was added to the *mqm* group.

4.7. Directory Structures

The following directories were loaded with owner *mqm* and group *mqm*. The directory properties were automatically set during installation of the MQSeries Integrator package.

Directory	Size	Contents
/opt/mqsi	300 MB	Default location of MQSI program files and documentation
/var/mqsi	50 MB	Default location of MQSI work files

Table 6: MQSeries Integrator directory structure on Sun Solaris run-time servers

4.8. Naming Conventions

See the *Integrated Technical Architecture Detailed Design Document –Volume 4 EAI Architecture* (Deliverable 16.1.2) for a description of the recommended naming conventions for the EAI product systems.

4.9. Installation Checklist

See Appendix C - MQSeries Integrator Checklist.

4.10. Startup and Shutdown Procedures

The MQSeries components (e.g., queue manager, listener, and channels) must be running prior to starting the MQSeries Integrator components. See section 2.10 Startup and Shutdown Procedures for the startup and shutdown procedures of the MQSeries components.

The broker domain is composed of components on both the Windows NT and Solaris platforms. The following steps must be followed in the sequence presented to start the broker domain:

Step	Task	Command
1	Start the Configuration Manager on Windows NT	mqsistart ConfigMgr
2	Start the Broker on Solaris	mqsistart MQSI_SAMPLE_BROKER

4.10.1. Build-time Environment

Choose Start->Settings->Control Panel->Services from the NT desktop. Start and Stop MQSeries Services via the GUI Services interface.

4.10.2. Run-time Environment

All MQSeries Integrator components are currently started and stopped manually.

4.11. Backup Procedures

Please refer to *MQSeries Integrator Version 2.0.1 Administration Guide* for information on backing up and restoring the MQSeries Integrator system.

4.12. References

- *MQSeries Integrator Version 2.0.1 Introduction and Planning*
- *MQSeries Integrator Version 2.0.1 Sun Solaris Installation Guide*
- *MQSeries Quick Beginning for Sun Solaris*

5 Acronyms

Acronym	Description
AE	Advanced Edition
CSD	Corrective Service Disk
HP	Hewlett-Packard
HTTP	Hypertext Transfer Protocol
IBM	International Business Machines
IFAP	Information for Financial Aid Professionals
IHS	IBM HTTP Server
IP	Internet Protocol
JDK	Java Development Kit
MB	Megabyte
MQ	Message Queuing
MQSI	MQSeries Integrator
MQWF	MQSeries Workflow
NIC	Network Interface Cards
NT	New Technology
OS	Operating System
RAM	Random Access Memory
SFA	Student Financial Assistance
TCP	Transmission Control Protocol
VDC	Virtual Data Center
XML	Extensible Markup Language

Appendix A – IBM MQSeries Messaging Installation Checklist

Appendix B – IBM DB2 UDB V6.1 Installation Checklist

Appendix C – IBM MQSeries Integrator Installation Checklist